

We claim:

1. A radiographic imaging assembly that has a system speed of at least 400 and comprises:

A) a symmetric radiographic silver halide film having a film speed of at least 700 and comprising a support that has first and second major surfaces and that is capable of transmitting X-radiation,

said radiographic silver halide film having disposed on said first major support surface, two or more hydrophilic colloid layers including first and second silver halide emulsion layers, and having on said second major support surface, two or more hydrophilic colloid layers including third and fourth silver halide emulsion layers, said first and third silver halide emulsion layers being the outermost emulsion layers on their respective sides of said support,

each of said first, second, third, and fourth silver halide emulsion layers comprising tabular silver halide grains that have the same or different composition and independently an aspect ratio of at least 35 and an average grain diameter of at least 3.0 μm and comprise at least 90 mol % bromide and up to 3 mol % iodide, both based on total silver in said grains,

said second and fourth silver halide emulsion layers comprising a crossover control agent sufficient to reduce crossover to less than 10%, and

B) a fluorescent intensifying screen arranged on each side of said radiographic silver halide film, said screen having a screen speed of at least 150 and a screen sharpness measurement (SSM) value greater than reference Curve A of FIG. 4, and comprising an inorganic phosphor capable of absorbing X-rays and emitting electromagnetic radiation having a wavelength greater than 300 nm, said inorganic phosphor being coated in admixture with a polymeric binder in a phosphor layer onto a flexible support and having a protective overcoat disposed over said phosphor layer.

2. The radiographic imaging assembly of claim 1 wherein said tabular silver halide grains in said first, second, third, and fourth silver halide

emulsion layers are composed of at least 95 mol % bromide and up to 0.5 mol % iodide, both based on total silver in the emulsion layer.

3. The radiographic imaging assembly of claim 1 wherein said tabular silver halide grains in said first, second, third, and fourth silver halide emulsion layers independently have an aspect ratio of from about 40 to about 50, an average grain diameter of at least 4.0 μm , and independently an average thickness of from about 0.08 to about 0.12 μm .

4. The radiographic imaging assembly of claim 1 wherein said tabular silver halide grains in said first, second, third, and fourth silver halide emulsion layers have essentially the same aspect ratio of from about 40 to about 50, an average grain diameter of at least 4.0 μm , and essentially the same average thickness of from about 0.09 to about 0.11 μm .

5. The radiographic imaging assembly of claim 1 wherein said tabular silver halide grains in said first, second, third, and fourth silver halide emulsion layers are dispersed in a hydrophilic polymeric vehicle mixture comprising at least 0.25% of oxidized gelatin, based on the total dry weight of said polymeric vehicle mixture.

6. The radiographic imaging assembly of claim 1 wherein said tabular AgX grains in said first, second, third, and fourth silver halide emulsion layers are dispersed in up to 1.5% deionized oxidized gelatin.

7. The radiographic imaging assembly of claim 6 wherein said tabular AgX grains in said first, second, third, and fourth silver halide emulsion layers are dispersed in from about 0.4 to about 0.6% deionized oxidized gelatin.

8. The radiographic imaging assembly of claim 1 wherein the dry, unprocessed thickness ratio of said first silver halide emulsion layer to that of

said second silver halide emulsion layer is greater than 1:1, and the dry, unprocessed thickness ratio of said third silver halide emulsion layer to that of said fourth silver halide emulsion layer is independently greater than 1:1.

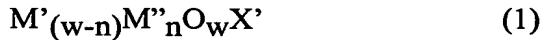
9. The radiographic imaging assembly of claim 1 wherein the molar ratio of silver in said first silver halide emulsion layer to that of said second silver halide emulsion layer is greater than 1:1, and the molar ratio of silver in said third silver halide emulsion layer to that of said fourth silver halide emulsion layer is independently greater than 1:1, the amount polymer vehicle on each side of said support is from about 30 to about 40 mg/dm², and the level of silver on each side of said support is from about 18 to about 24 mg/dm².

10. The radiographic imaging assembly of claim 1 wherein said crossover control agent in said radiographic silver halide film is present in an amount sufficient to reduce crossover to less than 8%.

11. The radiographic imaging assembly of claim 1 wherein said crossover control agent is a particulate merocyanine or oxonol dye that is present in each of said second and fourth silver halide emulsion layers in an amount of from about 0.75 to about 1.5 mg/m².

12. The radiographic imaging assembly of claim 1 wherein said inorganic phosphor is calcium tungstate, activated or unactivated lithium stannates, niobium and/or rare earth activated or unactivated yttrium, lutetium, or gadolinium tantalates, rare earth-activated or unactivated middle chalcogen phosphors such as rare earth oxychalcogenides and oxyhalides, or terbium-activated or unactivated lanthanum or lutetium middle chalcogen phosphor, or said inorganic phosphor contains hafnium.

13. The radiographic imaging assembly of claim 1 wherein said inorganic phosphor is a rare earth oxychalcogenide and oxyhalide phosphor that is represented by the following formula (1):



wherein M' is at least one of the metals yttrium (Y), lanthanum (La), gadolinium (Gd), or lutetium (Lu), M'' is at least one of the rare earth metals, preferably dysprosium (Dy), erbium (Er), europium (Eu), holmium (Ho), neodymium (Nd), praseodymium (Pr), samarium (Sm), tantalum (Ta), terbium (Tb), thulium (Tm), or ytterbium (Yb), X' is a middle chalcogen (S, Se, or Te) or halogen, n is 0.002 to 0.2, and w is 1 when X' is halogen or 2 when X' is a middle chalcogen.

14. The radiographic imaging assembly of claim 13 wherein said inorganic phosphor is a lanthanum oxybromides, or terbium-activated or thulium-activated gadolinium oxides.

15. The radiographic imaging assembly of claim 1 wherein said inorganic phosphor is an alkaline earth metal phosphor that is the product of firing starting materials comprising optional oxide and a combination of species characterized by the following formula (2):



wherein “M” is magnesium (Mg), calcium (Ca), strontium (Sr), or barium (Ba), “F” is fluoride, “X” is chloride (Cl) or bromide (Br), “I” is iodide, M^a is sodium (Na), potassium (K), rubidium (Rb), or cesium (Cs), X^a is fluoride (F), chloride (Cl), bromide (Br), or iodide (I), “A” is europium (Eu), cerium (Ce), samarium (Sm), or terbium (Tb), “Q” is BeO , MgO , CaO , SrO , BaO , ZnO , Al_2O_3 , La_2O_3 , In_2O_3 , SiO_2 , TiO_2 , ZrO_2 , GeO_2 , SnO_2 , Nb_2O_5 , Ta_2O_5 , or ThO_2 , “D” is vanadium (V), chromium (Cr), manganese (Mn), iron (Fe), cobalt (Co), or nickel (Ni), “z” is 0 to 1, “u” is from 0 to 1, “y” is from 1×10^{-4} to 0.1, “e” is from 0 to 1, and “t” is from 0 to 0.01.

16. A radiographic imaging assembly having a system speed of at least 400 and comprising:

A) a symmetric radiographic silver halide film having a film speed of at least 800 and comprising a support that has first and second major surfaces and that is capable of transmitting X-radiation,

said radiographic silver halide film having disposed on said first major support surface, two or more hydrophilic colloid layers including first and second silver halide emulsion layers, and having on said second major support surface, two or more hydrophilic colloid layers including third and fourth silver halide emulsion layers, said first and third silver halide emulsion layers being the outermost emulsion layers on their respective sides of said support,

each of said first, second, third, and fourth silver halide emulsion layers comprising tabular silver halide grains that have the same composition, independently an aspect ratio of from about 40 to about 50, an average grain diameter of at least 4.0 μm , and an average thickness of from about 0.09 to about 0.11 μm , and comprise at least 98 mol % bromide and up to 0.5 mol % iodide, both based on total silver in said grains,

each of said second and fourth silver halide emulsion layers comprising a particulate oxonol dye as a crossover control agent present in an amount of from about 1 to about 1.3 mg/m^2 that is sufficient to reduce crossover to less than 8% and that is decolorized during development within 45 seconds,

said film further comprising a protective overcoat on both sides of said support disposed over all of said silver halide emulsion layers,

wherein said tabular silver halide grains in said first, second, third, and fourth silver halide emulsion layers are dispersed in a hydrophilic polymeric vehicle mixture comprising from about 0.25 to about 1.5% of deionized oxidized gelatin, based on the total dry weight of said polymeric vehicle mixture,

wherein the dry, unprocessed thickness ratio of said first silver halide emulsion layer to that of said second silver halide emulsion layer is from about 3:1 to about 1:1, and the dry, unprocessed thickness ratio of said third silver

halide emulsion layer to that of said fourth silver halide emulsion layer is independently from about 3:1 to about 1:1, and

wherein the molar ratio of silver in said first silver halide emulsion layer to that of said second silver halide emulsion layer is from about 1.5:1 to about 3:1, and the molar ratio of silver in said third silver halide emulsion layer to that of said fourth silver halide emulsion layer is independently from about 1.5:1 to about 3:1, and

B) a fluorescent intensifying screen having a screen speed of at least 150 and a screen sharpness measurement (SSM) value that is at least 1.1 times that of reference Curve A of FIG. 4 at a given spatial frequency, and that comprises a terbium activated gadolinium oxysulfide phosphor capable of absorbing X-rays and emitting electromagnetic radiation having a wavelength greater than 300 nm, said phosphor being coated in admixture with a polymeric binder in a phosphor layer onto a flexible polymeric support and having a protective overcoat disposed over said phosphor layer.

17. The radiographic imaging assembly of claim 16 wherein two fluorescent intensifying screens are arranged in association with said radiographic silver halide film, one of either side thereof.

18. A method of providing a black-and-white image comprising exposing the radiographic silver halide film in the radiographic imaging assembly of claim 1 and processing said film, sequentially, with a black-and-white developing composition and a fixing composition, the processing being carried out within 90 seconds, dry-to-dry.

19. The method of claim 18 wherein the black-and-white image so provided is used for a medical diagnosis.